

REMARKS

The Examiner has maintained a rejection of pending claims 1-3, 6-8, 10, 12, 22, 27 and 28 under 35 U.S.C. §103(a) as being unpatentable over *Hamazu et al.*, *Buchwalter et al.*, *Ohnishi*, *Starkey* and *Green '592* in view of *Green et al. '938*. Applicants have amended claims 1, 27 and 28 so as to limit the range of the acid anhydride used as a curing agent to 0.3 to 1.4 mol per mol of the resin components. Support for this amendment is found at page 45, line 7 of the application. Claim 10 has been amended to depend on a pending claim.

The currently pending independent claims encompass a photopolymerizable resin with a specific sulfonium salt photopolymerization initiator present at 0.1 to 6.0 parts by weight per 100 parts by weight of the composition, and an acid anhydride curing agent present at 0.3 to 1.4 mol per mol of the resin components.

Hamazu et al. teaches a similar photo-initiator present in a wide range (0.1 to 20 parts) and mentions that acid anhydride may be added as an "auxiliary" in an undisclosed amount.

Buchwalter et al. generally espouses the use of sulfonium salt photoinitiators and generally espouses the use of a maleic anhydride.

Ohnishi discloses a specific sulfonium salt, but does not disclose the use of an acid anhydride curing agent.

Starkey discloses sulfonium salt as one of many possible photo initiators and acid anhydrides as one of many possible curing agents. The upper range of *Starkey's* curing agent overlaps with the lower range of the present invention. However, as will be explained below, one skilled in the art could not derive the present invention from this disclosure.

Green '592 discloses generally sulfonium salt photo initiators and anhydride curing agents.

Just as some of these references clearly do not anticipate the disclosed invention, none teaches, suggests or obviates that the specific claimed sulfonium salt at the specific claimed ratio in combination with the specific claimed anhydride curing agent would have the surprising results obtained in the current invention.

Applicants respectfully submit that there is no motivation or teaching in the art which would lead a skilled artisan to combine the references in a manner to obtain the invention of amended claim 1.

The §103 obviousness rejection cannot be based upon what a person skilled in the art might try or might find obvious to try, but rather must consider what the references would have led a person skilled in the art to do. "The mere fact that references can be combined or modified does not render the resultant combination obvious under the prior art also suggests the desirability of the combination." *In re Mills*, 916, F. 2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

"Obviousness cannot be established by combining the teachings of prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination." *ACS Hospital Systems, Inc. v. Monteffore Hospital*, 732, F.2d 1972, 1977, 221 USPQ 929, 937 (Fed. Cir. 1984).

One skilled in the art reviewing the references would not anticipate the results obtained by the present invention of using 0.1 to 6.0 parts by weight of the photoinitiator in combination with 0.3 to 1.4 mol of anhydride curing agent, because none of the references teaches or suggests that this specific compound ratio results in a chain curing reaction of almost simultaneous progress of energy-

curing and heat curing, nor do the references teach or suggest that this specific combination would result in a superior product in any way. In fact, the references teach away from the stated amount of anhydride curing agent.

In amended claim 1, the specific chain curing reaction is an almost simultaneous progress of different curing mechanism of energy-ray curing and heat curing caused by heat produced in the energy-ray curing and prevention of a shortfall in curing. See application, page 45, line 22 to page 46, line 1. This reaction can be performed by combining the specified amount, *i.e.*, 0.3 to 1.0 mol of acid anhydride and the specified amount, *i.e.*, 0.1 to 6.0 wt % of sulfonium salt polymerization initiator (IV), (IV') and (V). See application, page 45, line 7 to page 46, line 11 and page 49, line 15 to page 50, line 3. The references do not disclose the composition in which the specific components are combined at the specific ratios. Without the ratio disclosed as stated in the present invention, the chain reaction for curing will not occur, meaning that the resin will not be cured at depths where light does not reach.

In other words, each cited reference may disclose one component, however, they do not disclose the combination of the components with the specific amount, nor that a chain reaction will occur at the specified ratios. In contrast, in the present invention, it was found that only the combination of each of the components with the specific amount would lead to the chain curing reaction.

The Examiner has cited to *Starkey* as teaching similar use of the anhydride curing agent. However, *Starkey* teaches away from a high concentration. Specifically, *Starkey* teaches that the preferable range is 0.05 to 5 parts by weight and that if 10 parts by weight is exceeded, problems of

precipitation of crystals or decrease in liquid stability occur (col. 21, lines 12-23). This is exactly the opposite of the teachings of the present invention.

Attached is a Table that compares the compounding ratio between the present invention and the cited references. The Table exhibits the Examples corresponding to claim 1 (Examples 1-8, 11 and 12 from the specification), wherein the compounding ratio is calculated by parts by weight. The compounding ratio of the Added Examples is also shown.

In the Table, "resin 1" represents 3,4-cyclohexyl-methyl-3,4 epoxycyclohexanecarboxylate, while "curing agent 1" represents maleic anhydride. "Initiator 1" represents sulfonium salt polymerization initiator that is represented by Formula (IV), (IV') and (V). "Initiator 2" represents an iron-allene base compound on which applicants have filed a divisional application. "Other initiator" represents sulfonium salt polymerization initiator that are not included in Formula (IV), (IV') and (V).

As can be seen in the Table, the curing agent for the present invention is contained in the amount higher than those in *Starkey*. In other words, in the present invention, unless a large amount of curing agent is added, the curing resin composition cannot obtain the chain reaction. In this case, the curing agent is added in a higher amount than the thermohardening catalyst that is used in an amount of 0.01 to 10 parts by weight based on 100 parts by weight of the resin components in *Starkey*. See refer to weight parts of curing agent 1 in the Table. Again, according to *Starkey*, when the amount of the curing agent (the thermohardening catalyst) exceeds 10 parts by weight, the resulting resin composition suffers from some problems such as precipitation of catalysts or a decrease in the stability in liquid.

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In the present invention, the superior curing effect is performed under conditions that are considered impossible in *Starkey*. This is because the curing mechanism of the present invention is totally different from that of *Starkey* in that the present invention has the mechanism in which heat curing proceeds in sequence after energy-ray curing. As the Examiner clearly notes in the Office Action, the present invention teaches toward a much higher level of curing agent than *Starkey*, as the Examiner cites example 1 with a 20.2 parts to 100 parts ratio. In addition, in the chain curing reaction of the present invention, the curing agent such as maleic anhydride remains in the resin composition after curing so that the agent becomes a part of the resin composition.

Green also fails to teach or suggest the disclosed ratios as being a benefit. Column 11, lines 61 to 63 cited by the Examiner simply states "... the partially cured composition is heated so that curing is completed by means of the heat activated crosslinking agent." This statement does not provide motivation to use a curing agent at 0.3 to 10 parts of curing agent/resin.

In summary, it is neither disclosed nor suggested in any of the references that the specific sulfonium salt polymerization initiator is combined with acid anhydride serving as a curing agent at the specific compounding ratio. Therefore, the composition which leads to chain curing reaction cannot be anticipated from any of the above references.

Claims 1, 10 and 27-38 have been amended in order to more particularly point out, and distinctly claim the subject matter to which the applicant regards as his invention. It is believed that this Amendment is fully responsive to the Office Action dated **April 16, 2003**.

In view of the aforementioned amendments and accompanying remarks, claims, as amended, are in condition for allowance, which action, at an early date, is requested.

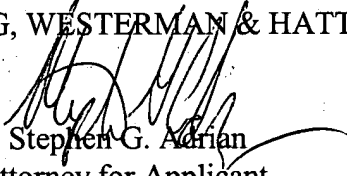
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If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

ARMSTRONG, WESTERMAN & HATTORI, LLP


Stephen G. Adrian
Attorney for Applicant
Reg. No. 32,878

MJC/SGA/rer:kas
Atty. Docket No. 001195
Suite 1000
1725 K Street, N.W.
Washington, D.C. 20006
(202) 659-2930



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TABLE 1

	resin 1 (weight parts)	curing agent 1 (weight parts)	initiator 1 (weight parts)	initiator 2 (weight parts)	other initiator (weight parts)
Example 1	79.83	20.17	-----	1.5	
Example 2	79.83	20.17	1.0	-----	
Example 3	79.83	20.17	0.5	-----	
Example 4	79.83	20.17	1.0	1.0	
Example 5	79.83	20.17	1.0	1.0	
Example 6	79.83	20.17	0.5	1.0	
Example 7	79.83	20.17	1.0	0.5	
Example 8	89.56	10.44	1.0	1.0	
Example 11	79.83	20.17	0.7	-----	
Example 12	68.74	17.37+(agent2)	1.0	1.0	
Added Example 1	79.83	20.17	1.0	-----	
Added Example 1	79.83	20.17	1.0	-----	
Added Example 1	79.83	20.17	0.2	-----	
Co.Example 1	100	-----	-----	1.5	
Co.Example 2	100	-----	1.0	-----	
Added Co. Co.Example 1	79.83	20.17	-----	-----	1.0
Added Co.Example 2	79.83	20.17	-----	-----	1.0